Appendix G

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City of Santa Barbara Environmental Programs that Support Water Quality Improvement Objectives

The City of Santa Barbara has a number of environmental programs that support water quality improvement objectives and supplement the Storm Water Management Program. These programs include integrated pest management, water conservation, recycling and household hazardous waste management, mandatory trash collection. A private lateral inspection ordinance is currently under development. The Creeks Division is also involved in a range of creek restoration and water quality improvement projects as well as community outreach programs that support the objectives of the Storm Water Management Program. Programs described below are City-specific initiatives and respond to Santa Barbara community priorities.

Integrated Pest Management

On June 17, 2003, the City Council of the City of Santa Barbara adopted Resolution 03-038 which directed staff to develop an Integrated Pest Management (IPM) strategy for all City Departments. In that resolution the City acknowledged the need to reduce the use of toxic pesticides and herbicides in public places, and to promote environmental stewardship. The City acknowledges that the IPM approach to pest management offers the best balance of environmental sensitivity, cost-effective pest management and public acceptance.

Integrated Pest Management is an effective and environmentally sensitive approach to pest management. It uses monitoring to determine pest levels and tolerance thresholds. IPM utilizes extensive knowledge about pests, such as infestation threshold, life histories, environmental requirements, and natural enemies to compliment and facilitate biological and other natural controls of pests. With the goal of minimizing health, environmental, and financial risks, the use of biological, cultural and physical control methods is emphasized with pesticides, generally least toxic pesticides, used only as a last resort. By reducing pesticide use, common household pesticides are less likely to show up in treated wastewater and in local waterways.

The City's IPM Strategy and 2004 Annual Report are posted on the City's website: http://www.santabarbaraca.gov/Resident/Community/Parks_and_Beaches/Integrated_Pest_Management.htm.

Water Conservation

The overuse of water to maintain urban landscapes can result in direct and indirect types of non-point source pollution including increased nutrient and soil runoff from the landscaped area and urban and developed lands, and the increasing demand for additional water supply reservoirs. Decreasing the amount of water used for landscape maintenance and implementing pesticide management plans can reduce the entry of these pollutants into surface and ground waters.[1]

[1] http://www.epa.gov/ow/you/chap2.html

The City of Santa Barbara depends on water conservation as a part of its water supply program. Many water efficiency improvements can be used at less cost than obtaining new water supplies, with no sacrifice of convenience, aesthetics, or functionality. Information on this program is available at:
www.santabarbaraca.gov/Government/Departments/PW/WCHome.htm or
www.sbwater.org.

Sewer Lateral Inspection Ordinance

Sewer laterals that are failing or adversely affecting the City's sewers represent a threat to public health and must be repaired or replaced. Although the Santa Barbara Municipal Code Section 14.44.160, Maintenance of Private Systems, Etc., identifies that it is the property owner's responsibility to maintain sewer laterals, very little attention is given to these pipes unless they fail. Poorly maintained laterals allow roots to grow into them that can cause blockages or sewage spills from the City's sewer mains during the process of root removal. This is the leading cause of dry weather spills in the publicly maintained part of the sewer system. Poorly maintained laterals also allow groundwater and rainwater into the sewer system during wet weather.

To address the concern, a Mandatory Lateral Inspection Ordinance is currently under development. The proposed triggers for residential properties are 1) the sale of property; 2) the addition or remodel of property that includes addition of 400 square feet and/or increases in the number of plumbing fixtures; 3) following a spill from the private lateral that reaches the public right-of-way; or 4) the identification of defects during routine inspections. The ordinance also proposes that commercial properties and Planned Unit Developments (condos) have their laterals inspected once every ten years. Additional information about the proposed ordinance can be obtained from the City's web site:
http://www.santabarbaraca.gov/Government/Departments/PW/WWLateralOrd.htm

Mandatory Trash Ordinance

Adequate trash collection services are provided for every residential dwelling and food serving business located within the City of Santa Barbara. Weekly refuse service regularly removes garbage and waste material to prevent the accumulation of materials that attract flies, rodents or other vectors as well as deter residents and food serving business owners from littering or contributing to illicit waste. Fees may be waived based for regular residential collection based on economic hardship.

Recycling and Hazardous Waste

Commingled recycling and green waste service is provided by the City's contracted waste haulers. All single-family residences are entitled to 95 gallons of recycling and 32 gallons of green waste recycling each week free of charge. Apartment complex residents are also encouraged to recycle. A small amount of recycling is free while the cost of recycling at larger complexes is less than the cost of trash. City recycling personnel also provide cost analysis for building managers. The City of Santa Barbara's Antifreeze, Batteries, Oil, and Paint (ABOP) facility accepts antifreeze, batteries, oil, paint, compact discs, and cell phones from residents at no cost. These free services offer an opportunity for Santa Barbara residents and businesses to dispose of waste in an environmentally friendly fashion, reducing the chance that these waste products will end up in City creeks. More information on this program is available at www.sbrecycles.org.

Creeks Restoration/Water Quality Improvement Division

The purpose of the Creeks Restoration/Water Quality Improvement Division is to improve the health of Santa Barbara's creeks and ocean through storm water and urban runoff pollution reduction, creek restoration, and community information and participation programs. Many of the Creeks Division education and outreach, enforcement, and municipal operations programs are described in Minimum Control Measures 1, 2, 3 and 6.

The Creeks Division is also engaged in two other voluntary long term planning and research community priority projects that support the City's water quality improvement objectives. These include microbial source tracking research to determine the extent to which humans and domestic animals contribute to bacterial pollution, and the development of long range watershed plans to establish community priorities for water quality funds.

Water Quality Research

Traditionally, indicator bacteria are used to infer the presence of human waste and associated pathogens, and the risk of associated diseases. However, it is well known that the use of indicator bacteria to assess the human health risk from recreational contact is problematic since indicator bacteria 1) are not pathogenic, 2) can survive and grow in the natural environment, making the identification of fecal sources difficult, and 3) tests rely on culturing bacteria although many bacteria live in the environment in a viable-but-non-culturable state.

In recent years methods have been developed to quantify bacteria and viruses associated with human waste in environmental waters. The development and employment of DNA-based (i.e. "molecular") tools for detecting and quantifying human fecal bacteria in the environment offers several benefits, namely: the independence from laboratory-based culture which fails to detect many microbes in the environment and in some cases generates false positive signals, the opportunity and promise for

detecting specific markers of human waste and / or the pathogens directly, and the use of these markers to understand the ecology of human fecal bacteria and pathogens in the environment through coupled studies of transport and fate.

The Creeks Division has been working with Dr. Patricia Holden of the University of California, Santa Barbara to use Microbial Source Tracking methods to determine the presence and potential origins of human waste in creeks and the ocean surf zone. Based on known high levels of bacterial contamination and the potential for humans to come into contact with polluted water, Old Mission Creek, mid and lower Mission Creek including the lagoon, and lower Arroyo Burro with an emphasis on the lagoon and beach processes comprise the study area. The project aims to identify potential upstream and intermediate sources of contamination, and assess the fates of contamination during transport in the creek, through lagoons, and into the ocean.

Long Range Planning

In fall 2004 the Creeks Division initiated a three-year long range watershed planning effort to establish a comprehensive long-range strategy for identifying and integrating programs to achieve flood management and protection, storm water and urban runoff pollution reduction, natural habitat protection and enhancement, and passive recreation and open space opportunities. Watershed plans can also provide direction for long-range program and project priorities of the Creeks Division and City-wide efforts to improve creek and ocean water quality, and protect and enhance creek resources. Organized in three phases, the first phase includes conducting community forums to identify priority watershed issues and preparing existing conditions studies to establish a baseline on the health and function of the Arroyo Burro, Mission, Sycamore and Laguna watershed. During the second phase, public forums will be held to evaluate the results of the existing conditions studies and establish watershed management priorities. The watershed plan will be draft during the third phase.

City of Santa Barbara Creeks Division Water Quality Monitoring Program Summary – May 2008

Monitoring Goals

Primary goals:

- Quantify the levels of bacterial and chemical pollution watersheds throughout the city in order to understand impacts of water quality to human health.
- Evaluate the effectiveness of the City's restoration and water-quality treatment projects in reducing pollutant levels.

Secondary goals:

- Determine the habitat quality for aquatic organisms, including fish, invertebrates, amphibians, and plants, in watersheds throughout the city
- Evaluate the effectiveness of the City's restoration and water-quality treatment projects in improving habitat quality.

Changes to existing program

The Creeks Division has collected numerous years of baseline data for indicator bacteria and has also analyzed spot samples for chemical constituents. The monitoring program was expanded considerably in the FY08 Research Plan, which went into effect in March 2007. Under the new Research Plan, routine monitoring of bacterial and chemical constituents is conducted on each watershed on a quarterly basis. By using triplicate sampling for fecal indicator bacteria counts, precision will be improved, as recommended at the EPA's National Beaches Conference.

Analysis of project effectiveness will involve intensive spatial monitoring of select sites on a quarterly basis, along with more frequent analysis of upstream and downstream sample points. The CDS and UV treatment at the Westside Drain should reduce bacteria, turbidity and total suspended solids. The UV treatment should have no impact on the other constituents. Low flow diversions of storm drains to sewers at Hope and Haley are predicted to reduce all pollutant/ constituent levels when the diversions are operating. Bioswales and created wetlands may potentially reduce some pollutant levels.

Adaptive Monitoring

Monitoring data is examined on a quarterly basis to identify problem areas and evaluate the effectiveness of the monitoring. The monitoring program will be reexamined annually and modified as needed to focus on sampling the chemical pollutants that have been identified as problems within each tributary, creek, and/or estuary. Additionally, input from the Bren student group project on land use and monitoring will likely be incorporated, as appropriate. Information provided by the USGS statistical analysis of water quality data may also inform future sampling decisions.

New methods for microbiological contamination may also be incorporated into future monitoring plans. Microbial source tracking methods that are being tested by Patricia Holden at UCSB under a contract with the Creeks Division may be ready for monitoring use in the near future. The Creeks Division will continue to review the scientific and regulatory literature to stay abreast of adaptations to traditional tests for indicator bacteria and the development of tests that are more specific to human waste and/or pathogens.

Research Questions and Sampling Strategies: FY08 Research Plan

A. Routine Watershed Assessment – *Is overall water quality in our watersheds getting better over time? Are new hot spots emerging? Are chemical pollutants a problem in our watersheds?*

1. Conduct biweekly sampling for FIB/field parameters at integrator sites for each watershed in order to track long term changes (see attached sampling schedule and map).
2. Conduct quarterly snapshot sampling for each watershed (see map and table below) in order to track long term changes and to identify pollutant routes to creeks
    a. Include FIB and field parameters at all sites (5-10 per watershed).
    b. Include chemical pollutants and nutrients at several sites.
    c. Include toxicity at integrator sites.
    d. Include sediment sampling at lagoon sites.
3. Develop tools to track fluxes and loads.
    a. Estimate flow rates at most sample sites
        i. Obtain staff training to conduct flow estimates in creeks when sampling.
        ii. Develop stage-discharge curves where possible.
        iii. Sample at sites with existing gauges (USGS and UCSB).
    b. Develop capability to measure flows in storm drains with dynamic flow rates and flow-triggered sampling (semi portable system).
        i. Add one drain system in FY08 (some equipment will overlap with storm system).
        ii. Add additional drains, pending grant funding.
4. Conduct FIB/field sampling at drain outlets and up drainage networks of key storm drains.
    a. Use Bacterial Reduction Study (2002) and City's Storm Drain Atlas as a guide.
    b. Conduct ground surveys to understand point sources, including sumps and groundwater pumps.
    c. Use automated samplers when feasible and otherwise collect multiple samples/flow measurements.
    d. Use flow, FIB, and DNA-based tools for sample analysis (see source tracking below).
5. Conduct rapid response to persistent beach warnings (sanitary surveys)

a. Sample up creeks and drains when beach warnings are posted for three of four sampling dates.

6. Investigate watershed models to improve interpretation of monitoring data. Begin with H20Map, which the City also uses to model the sanitary sewer system.
7. Develop strategy to use GIS to organize, present, and analyze water quality data.

B. Restoration and Water Quality Project Assessment – *Are the Creeks programs improving water quality at select sites with restoration project and/or water quality treatments projects? What is the baseline water quality at future restoration/treatment sites?*

1. AB Estuary Restoration
    a. Upstream/downstream sites for comparison pre with pre-project data.
    b. Sites: AB at Cliff Drive, AB Lagoon Mouth, AB Surf, Mesa Above, Mesa Below.
    c. Biweekly FIB/field parameters.
    d. Quarterly nutrients and metals.
    e. Quarterly spatial intensives for FIB/field parameters in Old Mission Creek (10 samples per intensive).
2. SURF Water Quality Improvement Project
    a. Weekly estimates of FIB load treated during 2007 AB411 dates (sample inlet port in vault); grant requirement.
    b. Biweekly FIB/field parameters at downstream sites for comparison with pre-project data (Westside Drain, OMC at W. Anapamu, MC at Gutierrez, MC at Montecito).
    c. Monthly testing within treatment facility (FIB/field).
    d. Quarterly spatial intensive for FIB/field.
3. Old Mission Creek Restoration Project
    a. Biweekly FIB/field parameters at upstream/downstream sites for comparison with pre-project data (Westside Drain, OMC at W. Anapamu; overlaps with SURF).
    b. Quarterly spatial intensive (overlaps with SURF).
4. Hope and Haley Diversions
    a. Monthly load estimates by sampling in manholes.
    b. Biweekly FIB/field parameters at downstream sites (AB below SRC and MC at Guitierrez).
5. Las Positas Storm Water Management Project
    a. Sample during storms, including constituents and FIB/field parameters.
6. W. Figueroa Storm Water Project
    a. Sample during storms at W. Anapamu Bridge, including constituents and FIB/field parameters.
7. Laguna Channel Water Quality Improvement
    a. Biweekly baseline at integrator site (FIB/field parameters).
    b. Quarterly snapshot

C. Storm Monitoring -- *Which pollutants are seen at high levels during storm events? How do restoration/treatment projects impact water quality during storm events? How do these answers change during a storm hydrograph?*

1. Develop capability to conduct automated, flow-triggered sampling at integrator sites (Mission Creek, Arroyo Burro, and Sycamore Creek).
    a. Begin with Mission Creek integrator site in FY07.
    b. Add Arroyo Burro in FY08.
    c. Add Sycamore Creek in FY09.
    d. Investigate feasibility in Laguna Channel
2. Develop capability to conduct automated, flow-triggered sampling in storm drains sites (semi-portable systems).
    a. Add one drain systems in FY08.
    b. Use County's new online system for storm tracking.
3. Conduct first-flush sampling at integrator sites.
    a. Use first quarter inch of rainfall as sampling point for sites without real-time flow data.
    b. Use flow-weighted composite sampling for sites with real-time flow data.
    c. Include full suite of constituents, including pesticides/herbicides and toxicity.
    d. Do not include indicator bacteria, due to short holding times.
4. Conduct load assessment at two additional storms per year at sites with gauges/autosamplers (limited constituents).
5. Conduct sampling at project assessment sites during two storms per year.
6. Conduct indicator bacteria studies in Mission Creek during two storms per year.
7. Conduct visual study of foam inputs to creeks during one storm.

D. Source Tracking—*What are the main sources of microbiological contamination?*

1. Maintain research with Dr. Patricia Holden (UCSB) and continue to pursue additional grant funding.
2. Analyze select samples from drain studies in Routine Watershed Assessment for DNA markers.
3. Outsource samples for a microbial source tracking study using E. Coli ribotyping to estimate the percent of different sources in Arroyo Burro Estuary, Mission Lagoon, and Laguna Channel

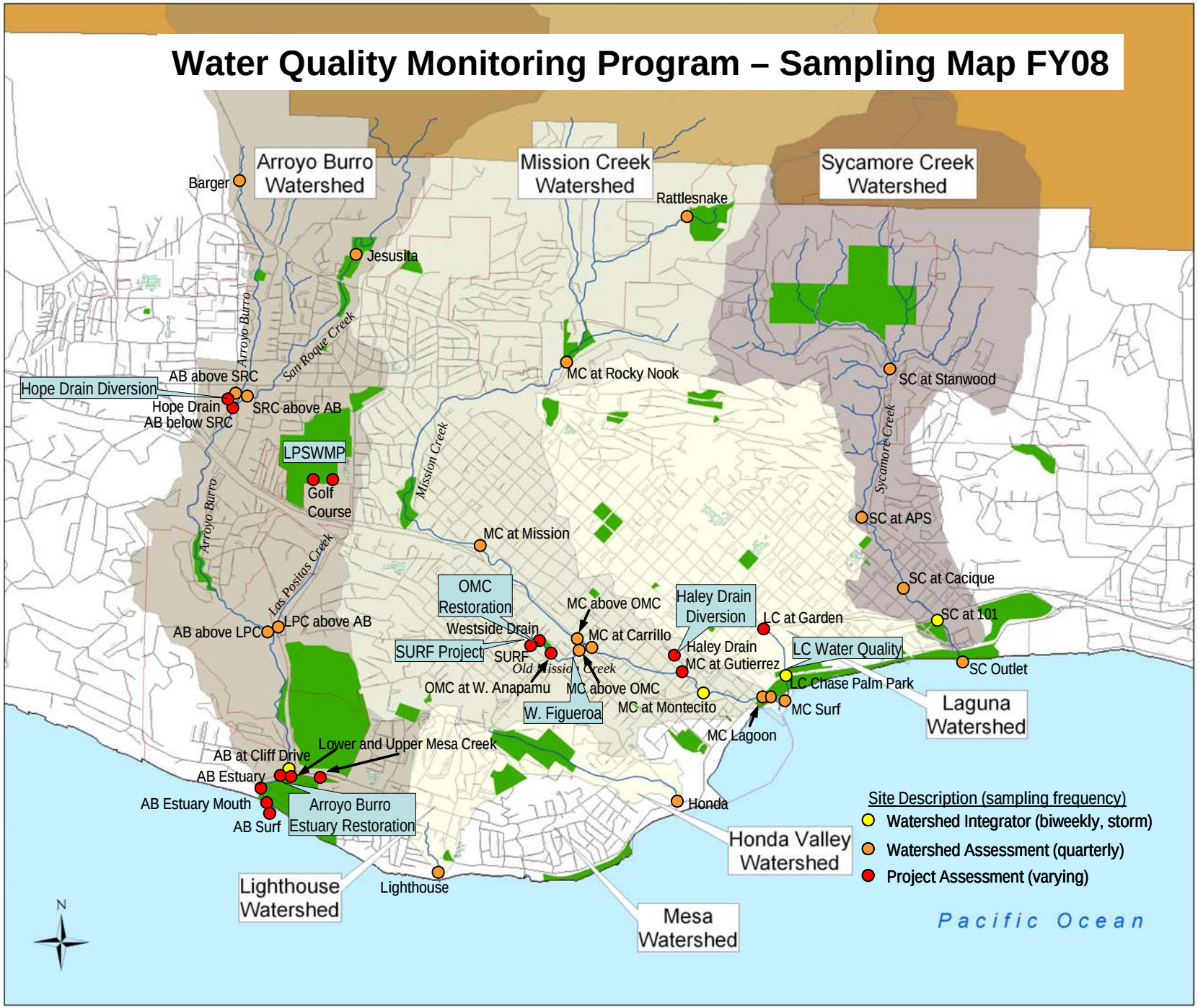
E. Data Quality and Variability– *Are the methods we use accurate? How variable in space and time are the data?*

1. Indicator bacteria
    a. Field replicates are collected each week to evaluate accuracy of sample collection.
    b. Automatic sampling and flow-measuring devices will assess hourly and daily variability in flow and specified contaminants.

c. Samples are collected from Arroyo Burro Beach surf zone to compare with Project Clean Water's data.

Summary of Sites and Sampling Frequency

	ROUTINE WATERSHED			PROJECT ASSESSMENT			STORM		
SITE	**FIB/field**	**Constit.**	**Nuts.**	**FIB/field**	**Constit.**	**Nuts.**	**FIB/field**	**Constit.**	**Nuts.**
Arroyo Burro Watershed									
ABSurf				biweekly					
AB Lagoon Mouth				biweekly	quarterly	quarterly			
AB Lagoon, Lower		quar-sed							
AB1850	Biweekly-F	quarterly+ toxicity			quarterly	quarterly		First Flush+2	First Flush+2
Mesa below				Biweekly-F	quarterly	quarterly			
Mesa above				Biweekly					
AB above LPC	quarterly	Quarterly							
LPC above AB	quarterly	Quarterly							
AB below SRC				Biweekly*					
AB above SRC	quarterly	Quarterly							
SRC above AB	quarterly	Quarterly							
Barger	quarterly	Quarterly							
Jesusita	quarterly	Quarterly							
Golf Course				Storm	storm	storm			
Hope Drain-Load				Monthly					
Spatial Intensive at AB				quarterly					
Mission Creek Watershed									
Surf Zone	quarterly								
MC Lagoon Mouth	quarterly								
MC Lagoon Upper		quar-sed							
MC at Montecito	Biweekly-*F	quarterly+toxicity	quarterly					First Flush+2	First Flush+2
MC Guiterrez				Biweekly					
MC above confluence	Quarterly								
MC at Mission	Quarterly	quarterly	quarterly						
MC at Rocky Nook	Quarterly	quarterly	quarterly						
Rattlesnake	Quarterly	quarterly	quarterly						
OMC above confluence	Quarterly	quarterly	quarterly						
OMC at W. Anapamu				Biweekly	quarterly	quarterly			
Westside Drain				Biweekly	quarterly	quarterly			
SURF-load				weekly during dry					
SURF-month				monthly during dry					
Haley Drain-load				Monthly					
W. Fig-site(s)				storm	storm				
LC (if joined)	Quarterly								
Spatial Intensive at Bohnett				quarterly					
Laguna Watershed									
LC @ CPP	Biweekly	quarterly+ sed+tox	quarterly					First Flush+2	First Flush+2
LC at Garden				quarterly	quarterly				
Manhole 1 (TBD)				quarterly	quarterly				
Manhole 2 (TBD)				quarterly	quarterly				
Manhole 3 (TBD)				quarterly	quarterly				
Sycamore Watershed									
SC Surf	Quarterly								
SC Outlet (if running)	Quarterly								
SC at 101	Biweekly-*F	quarterly+ sed+tox	quarterly					First Flush+2	First Flush +2
SC at Cacique	Quarterly	quarterly	quarterly						
SC at APS	Quarterly	quarterly	quarterly						
SC at Stanwood	Quarterly	quarterly	quarterly						
Additional									
Lighthouse	Quarterly								
Honda	Quarterly								
Additional Drains (TBD)	125	20							
Additional Storm (TBD)							100	20	10


Water Quality Monitoring Program – Sampling Map FY08
Arroyo Burro Watershed
Mission Creek Watershed
Sycamore Creek Watershed
Laguna Watershed
Honda Valley Watershed
Mesa Watershed
Lighthouse Watershed
Barger
Jesusita
Rattlesnake
Arroyo Burro
San Roque Creek
Mission Creek
Sycamore Creek
Las Positas Creek
Old Mission Creek
Hope Drain Diversion
AB above SRC
Hope Drain
AB below SRC
SRC above AB
LPSWMP
Golf Course
MC at Rocky Nook
SC at Stanwood
MC at Mission
SC at APS
SC at Cacique
SC at 101
SC Outlet
OMC Restoration
Westside Drain
SURF Project
SURF
MC above OMC
MC at Carrillo
Haley Drain Diversion
Haley Drain
MC at Gutierrez
LC at Garden
LC Water Quality
LC Chase Palm Park
MC Surf
MC Lagoon
MC at Montecito
OMC at W. Anapamu
W. Figueroa
AB above LPC
LPC above AB
Lower and Upper Mesa Creek
AB at Cliff Drive
AB Estuary
AB Estuary Mouth
AB Surf
Arroyo Burro Estuary Restoration
Honda
Lighthouse
Site Description (sampling frequency)
Watershed Integrator (biweekly, storm)
Watershed Assessment (quarterly)
Project Assessment (varying)
N
Pacific Ocean